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Null current hysteresis for acetylacetonate based perovskite solar cells as electron extraction layer

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Solution processed zirconium acetylacetonate (Zr(acac)) is successfully employed as an electron extraction layer, replacing conventional titanium oxide, in planar $\text{CH}_3\text{NH}_3\text{PbI}_3$ perovskite solar cells. As-prepared Zr(acac) film possesses high transparency, high conductivity, a smooth morphology, high wettability, compatibility with PbI_2 DMF solution, and an energy level matching that of $\text{CH}_3\text{NH}_3\text{PbI}_3$ perovskite material. An average power conversion efficiency of about 11.93%, along with a high filling factor of 74.36%, an open circuit voltage of 1.03 V, and a short-circuit current density of 15.58 mA/cm². The overall performance of the devices is slight better to that of cells using ruthenium acetylacetonate (Ru(acac)). The difference of solar cells with different electron extraction layers in charge recombination, charge transport and transfer and lifetime are further explored and demonstrate that Zr(acac) is a more effective and promising electron extraction layer. This work provides a simple and cost effective route for the preparation of an effective whole extraction layer.

Biography

Abd Rashid bin Mohd Yusoff received his BA in Physics with Education from Universiti Putra Malaysia, MSc in Applied Physics from Universiti Malaya, and PhD in Physics from Universidade Federal do Parana, Brazil. After graduation in 2011, he joined the faculty in the Department of Information Display at the Kyung Hee University as a Post-doctoral fellow studying organic photovoltaic (OPV), organic light emitting diodes (OLEDs), and quantum-dots light emitting diodes (QLEDs). In 2012, he was promoted as a Research Professor at Kyung Hee University and continues working on OPV and OLEDs as well as QLEDs. He has published more than 60 articles in these fields and being invited to various seminars and conferences. He also contributed 4 book chapters and edited 2 books. In addition, he is also one of the technical organizing committees for the 3rd Conference on New Advances in Condensed Matter Physics (NACMP 2016, February 28-March 1), Beijing, China. Furthermore, he was also an Editor-in-Chief of Theme Collection in Nanoscale (Graphene-based Energy Devices) (Royal Society of Chemistry). His research interests include electronic properties of organic semiconductor thin films, charge transport properties, device physics, organic and inorganic-based light emitting devices, organic photovoltaic and organic transistors.

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